Q. 1 An aq. soln of decimolar potasium ferocynide dissociates 40%. Cal. π of soln at 27°C.

Sol. $C = \frac{1}{10}$; $K_4[Fe(CN)_6] \rightleftharpoons 4K^+ + [Fe(CN)_6]^{4-}$

$\alpha = 40\% = 0.4$

$n = 5$

$\pi = iCRT$

$\alpha = \frac{i-1}{n-1} \Rightarrow 0.4 = \frac{i-1}{5-1}$

$i - 1 = 1.6$

$\boxed{i = 2.6}$

$\pi = 2.6 \times \frac{1}{10} \times 0.0821 \times 300$

$\pi = 2.6 \times \frac{1}{10} \times 24.6 \Rightarrow \boxed{\pi = 6.4\ atm}$

1.17 g. Solute in 100 ml Solⁿ.

Q. 2. 1.17% aq. Solⁿ of NaCl is isotonic with 7.2% aq. Solⁿ of glucose. Cal vant Hoff factor of NaCl.

7.2 g Solute in 100 ml Solⁿ.

Sol.

$$\pi_{NaCl} = \pi_{glucose}$$

$$i_1 C_1 \cancel{R} \cancel{T} = i_2 C_2 \cancel{R} \cancel{T}$$

$$i_1 \times \frac{1.17}{58.5} \times \frac{10\cancel{0}0}{1\cancel{0}0} = 1 \times \frac{7.2}{180} \times \frac{10\cancel{0}0}{1\cancel{0}0} \Rightarrow \boxed{i_1 = 2}$$

Q.3. In an 0.2 m of aq. sol^n of monobasic weak acid (HX) have degree of dissociation is 0.3. Cal. freezing point (T_f) of sol^n; $k_f = 1.86 \left(\frac{k-kg}{mol}\right)$

Sol. $\Delta T_f = i k_f \cdot m.$

given :- $\alpha = 0.3$
$m = 0.2$
$k_f = 1.86$

$\Delta T_f = 1.3 \times 1.86 \times 0.2$

$$HX \rightleftharpoons H^+ + X^-$$

$n = 2$

$$0.3 = \frac{i-1}{2-1}$$

$$0.3 = \frac{i-1}{1}$$

$\Rightarrow 0.3 = i - 1$

$$\boxed{i = 1.3}$$

$\Delta T_f = 0.26 \times 1.86$

$\boxed{\Delta T_f = 0.48}$

$\Delta T_f = \underline{T_f^{\circ}} - T_f$

$0.48 = 0 - T_f$

$\boxed{T_f = -0.48^{\circ}c}$

Ⓠ.5 At 300 k the osmotic pressure of 0.1 M aq. soln of MgCl₂ is 4.92 atm. Cal. degree of dissociation of $MgCl_2$.

Sol. given :-

$T = 300k$

$C = 0.1M$

$\pi = 4.92 atm$

$\alpha = ?$

$MgCl_2 \rightleftharpoons Mg^{2+} + 2Cl^-$

$n = 3$

$\pi = iCRT$

$4.92 = i \times 0.1 \times 24.6$

$\cancel{4.92}^{2} = i \times \cancel{2.46}$

$\boxed{i = 2}$

$$\alpha = \frac{i-1}{n-1}$$

$$\alpha = \frac{2-1}{3-1} \Rightarrow \alpha = \frac{1}{2} = 0.5$$

$$\boxed{\alpha = 50\%}$$

V.V. imp.

Q. 6- Which of the following aq. soln has least freezing point.

(1) 1m Urea ($i = 1$) (2) 1 m K_2SO_4 ($i = 3$) (3) 1m NaCl ($i = 2$)

(4) 1m $Al_2(SO_4)_3 \rightarrow i = 5$

if $\alpha = 100\%$

$\alpha = 1$

then

$i = n$

Ques. Following are equimolal aq. soln. → weak acid.

(a) 1 m Urea $i = 1$ (b) 1 m $MgCl_2$ $i = 3$ (c) 1 m CH_3COOH $2 < i > 1$

(d) 1 m Na_3PO_4 $i = 4$ (e) 1 m KCl $i = 2$

arrange a, b, c, d, & e in increasing order of

✓ (i) Boiling Point

(ii) Freezing Point

✓ (iii) O.P.

(iv) V.P.

Sol.

(a) B. Pt ÷ & (c)

$(a) < (c) < (e) < (b) < (d)$

(b) & (d) $(d) < (b) < (e) < (c) < (a)$

Azeotropic mixture

\# mixture of liquids which boils at Constant temp., like a pure liquid is k/a azeotropic mixture.

\# AzeDtropic mixture have same composition in liquid & Vapour Phase.

Components of azeotropic mixture Cannot seperated by fractional distilation

There are two type of azeotropic mixture

(i) minimum boiling azeotropic mixture

(+Ve deviation)

Ex÷ $H_2O + C_2H_5OH$

373K 351.3K

351.2K

(2) maximum boiling point azeotropic mixture

(-ve deviation)

$H_2O + HCl$

373K 188K

363K

① V.P. $\propto \frac{1}{Ci}$

(2) R.L.V.P. $\left(\frac{P_A^o - P_s}{P_A^o}\right) \propto Ci \hookrightarrow (m)$

(3) $\Delta T_b \propto ic \rightarrow (m)$

(4) $T_b \propto ic$

(5) $\Delta T_f \propto ic$

(6) $T_f \propto \frac{1}{ic}$

(7) $\pi \propto ic$

For dilute Soln

$m \approx M$

OR

$m \approx c$